Chapter 5

Fire-Prevention Operations

5-1. The purpose of fire prevention is to eliminate hazards and elements that cause fires and to eliminate conditions that will contribute to a fire spreading. In a TO, this is more important than ever. In most cases, the available fire-fighting resources will not be adequate to handle the areas of responsibility, which makes preventing fires more important. Effective fire prevention requires establishing well-planned programs. Enforcing the guidelines in these programs can save the effort and expense of extinguishing fires and reduce the loss of life. Fire departments must have command support and cooperation to implement and maintain these programs.

SECTION I. PLANS AND PROCEDURES

5-2. To enhance the effectiveness of fire inspections and assistance to a community, fire-department personnel must be well-versed in the organizational structure of their fire department and the roles and responsibilities of each section. An integral source in a fire-inspection process is prefire plans. These plans provide fire personnel relevant information about a structure or an aircraft that may be involved in a fire. The information could significantly enhance the potential success of a fire department's operations. If prefire plans are properly maintained and updated, firefighter safety is increased and firefighters will know about any special hazards or dangers in advance.

FIRE REGULATIONS

5-3. DOD, DA, and local fire-prevention regulations must be available to all fire personnel. An installation's fire marshal prepares local fire regulations. They must define the fire-protection functions for all areas on an installation, such as tenant units, assigned detachments, family housing, and quarters. Local regulations should include the following items:

- A statement on the importance of fire prevention.
- The responsibilities of people in fire prevention. People at all levels on an installation should be included.
- The fire-safety areas, which include the location of fire exits, first-aid stations, and fire extinguishers. Also included should be fire-reporting and -fighting procedures.

- The policies concerning smoking, fire inspections, storage areas, electrical wiring and appliances, static electricity, flammable liquids, flammable compressed gases, explosive atmospheres, and maintenance operations.

PREFIRE PLANS

5-4. Fire departments are organized so that fire personnel can protect life and property from fire. All personnel must study their area to know what problems exist. After analyzing the problems, they can devise prefire plans to handle the problems. Fire-department personnel should consider the following:

- Area one, an installation's layout. This layout includes the streets, roads, and alleys from a fire station to a fire scene; the location of the water supply and the available volume and pressure; and the buildings' exposure.
- Area two, the availability of equipment. This area includes the types of apparatus, vehicles, and mechanical and motorized equipment on an installation.
- Area three, available personnel.

5-5. Prefire plans must be flexible to allow for changes in personnel and equipment availability. The areas to consider are the—

- Location of flammable stores, hazardous-operations areas, and areas that could be a fire's point of origin.
- Location of hydrants and other water sources, with readings of available amounts and pressures.
- Lengths of ladders and the proper placement spots to reach all required areas.
- Horizontal or vertical openings, (hallways, open stairways, shafts, false ceilings, or attics) that would be good ventilation openings.
- Best and most available apparatus for responding to a fire, approaching buildings, conducting hose-laying procedures, and placing water streams.
- Location of the utilities and who shuts them off and how.
- Effects of weather changes on building accessibility and response time.
- Installed fire-protection or -detection systems, including locations and procedures for connecting pumpers to installed extinguishing systems.

AIRCRAFT

5-6. Prefire plans for aircraft crash/rescue operations require more flexibility than prefire plans for structural fires. Because the exact crash location is unknown, only make general plans as to likely crash sites. When developing prefire plans, remember the location, mission, climate, and terrain of your installation.

5-7. Prefire plans should include information on the different types of aircraft handled at an installation. Appendix B details several Army aircraft. The control tower can obtain specific information (number of personnel, amount of fuel, amount and type of ordnance on board, nature of an emergency) at the time of the emergency.

5-8. The weather, terrain, runway conditions, amount of available equipment and remaining fuel, and crash location are some factors that govern placing equipment at an aircraft's crash operation. Prefire plans can only cover general placement procedures and should allow for flexibility, based on the situation. Other factors to consider include an aircraft's landing speed, the wind direction and speed, and an aircraft's stopping distance. Prefire plans should also include provisions for acquiring additional equipment.

MISSILE AND SPACE VEHICLE

5-9. Fire-protection personnel at missile and space-vehicle test or launch sites deal with different hazardous situations. The prefire plans must include procedures for safely storing, handling, and disposing the liquid and solid propellants used in missile engines. Plans should include the—

- Number, type configuration, and operation of missiles or space vehicles and related launch facilities.
- Layout of the launch site, including access roads, terrain, and water supplies.
- Number, type, and location of support facilities.
- Location and configuration of the various propellant storage areas, the nature of the stored materials, and the extinguishing agents which are the safest and most effective for each type of propellant.
- Health hazards that could result from the fuels, oxidizers, other chemicals, and additives to fuels or coolant water. Firefighters may have to wear special protective clothing, reduce or control exposure time, monitor instruments, or perform special procedures.

NATURAL-COVER FIRES

5-10. These fires present different problems for firefighters. Natural-cover fires can cover various-sized areas, involve large numbers of fire-fighting personnel, and require specialized tactics and equipment. Prefire plans are usually limited to information about the type and quantity of available tools and equipment, the people to contact for personnel support, the agencies which can provide assistance, and the current weather information.

PREDISASTER

5-11. Fire-protection personnel usually assist during earthquakes, tornadoes, and floods. Fire-fighting plans should include how to handle disasters and how to safeguard and use the needed equipment, effectively, during a disaster.

SECTION II. WATER SUPPLY

5-12. Water requirements on an installation vary daily. However, the water supply needed for fire fighting must be met at all times. The water supply in sources such as supply lines, wells, and pumps is often not sufficient during high-demand periods. During low-demand periods, water should be stored for use during high-demand periods. Stored water must also be available for emergencies resulting from fires, power failures, breakdown of supply pumps, or accidents. During normal use, stored water must be at or above the level required for fire fighting.

STORAGE

GROUND STORAGE

5-13. Ground storage consists of covered tanks or reservoirs located on the same level as a distribution system. These tanks and reservoirs are more commonly used for receiving tanks, treatment tanks, and limited or special storage. Some installations may have emergency reservoirs. These reservoirs consist of small ground-storage tanks that are supplied by the distribution system but are not permanently connected to the system.

HIGH-LEVEL STORAGE

5-14. High-level storage is the preferred storage method. Where practical, the tanks should be located near the centers of high-water-demand areas to equalize the pressures during periods of peak demand. One high-level-storage method is to elevate standpipes or tanks that are mounted on columns or legs. Another method is to locate one or more ground-storage tanks above the distribution system. These tanks provide a head pressure similar to that of a normal hydraulic grade line.

REQUIREMENTS

5-15. A water-supply system supplies water for domestic, industrial, and fire-protection demands. Domestic demands include functions such as drinking, cooking, bathing, laundering, and watering cultivated areas. Industrial demands include requirements for areas such as central and local heating and cooling equipment and engineering shops. Fire-protection demands include water requirements for hose-line operations and for installed devices such as sprinklers, standpipes, and deluge systems.

5-16. The most important factors that govern a water-supply system are the reliability and capacity of the source, the distribution system, and the storage facilities. A fire inspector must know of any deficiencies in a water-supply system to cope with the available water supply during fire operations. A fire inspector may be asked to appraise a water-supply system at an installation. He should investigate the—

- Amount of stored water that is needed to meet an installation's requirements.
- Type of water storage that is best suited for an installation.

- Provisions for emergency supply and distribution of water.
- Type and size of a normal distribution system.
- Spacing requirements for fire hydrants in all locations.
- Amount of water that is available for fire-fighting operations at all locations on an installation.

WATER

5-17. When practical, an installation's primary water supply should be acquired from a nearby municipality or private water company. When that is not practical, the water supply may come from wells, canals, streams, rivers, lakes, or ponds, depending on an installation's location. The primary supply should include a pressure source in the system. The water supply should originate from two independent sources to ensure water availability if one system fails.

5-18. When a supply source is groundwater, the fluctuation of the groundwater table must be considered. When a supply source is from nearby municipalities, a fire inspector must ensure that the water-supply system is ample and dependable. When a water source is wells, at least two wells should be used. At a minimum, twice as much water should be available as is consumed during an average day. Under these conditions, standby pumping units that have power sources independent of a main system should be available.

DISTRIBUTION SYSTEMS

5-19. The network of mains (feeder and distributors) and fire hydrants that make up the distribution system are laid out as either a grid or a nongrid system. In a large water-distribution system, the mains are classified as—

- Primary feeders, which are large pipes widely spaced to feed the smaller pipes.
- Secondary feeders, which are medium-sized pipes that help supply water at specific locations.
- Distributors, which are small mains that feed individual fire hydrants and other outlets.

Grid System

5-20. This system is laid out in the form of a grid iron. The piping is interconnected from several directions. The pipes are arranged in loops and are supplied from two or more sides. This system works best because hydrants and other connections are fed from many directions, which will increase water delivery. A full grid system does not have dead-end mains.

Nongrid System

5-21. This system is a one-directional flow system. Water flows from a large primary main to smaller feeders. Generally, all feeders result in dead ends. Some negative features of a nongrid system are an increase in friction loss, a quick loss of pressure due to one-directional flow, an operation from dead-end feeders, and increased deposits and foreign matter in all the piping.

FIRE HYDRANTS

5-22. A dry-barrel-type hydrant (Figure 5-1) is used in areas that are subjected to freezing temperatures. A valve is located below the freeze line and is opened with the pressure or against the pressure. After it has been opened and closed, any remaining water in a closed dry-barrel hydrant will drain through a valve at the bottom of the hydrant.

5-23. A wet-barrel-type hydrant (Figure 5-1) is used in areas where temperatures are milder. This hydrant has either a compression-type valve at each outlet or one valve located in the bonnet to control the water flow to all outlets.

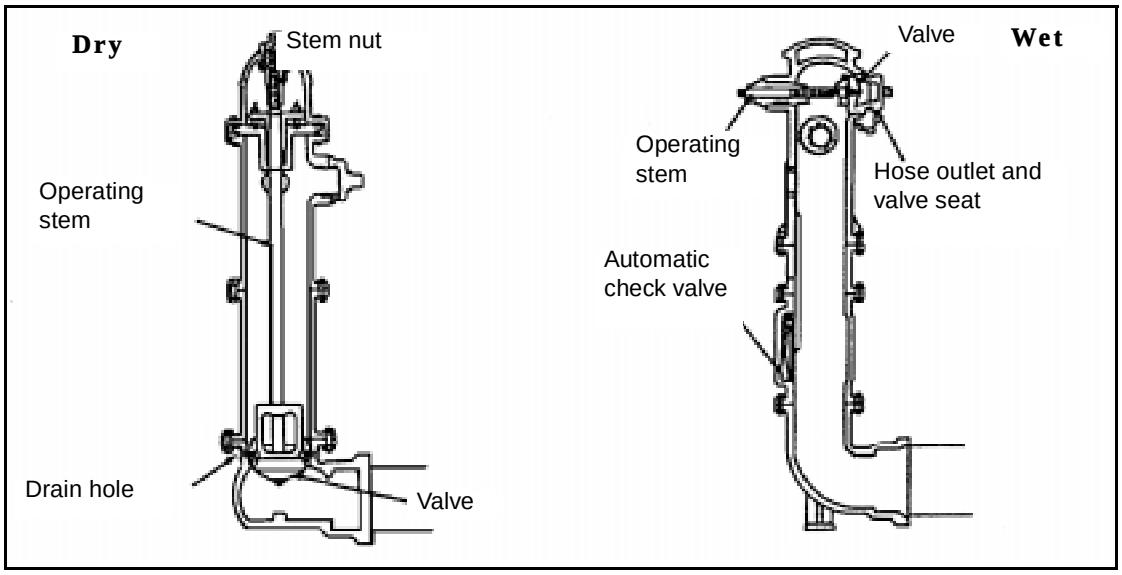

Figure 5-1. Fire Hydrants

LOCATION AND SPACING

5-24. In housing areas, the hydrants should be about 400 feet apart and placed so that two hydrants can reach every building. Firefighters should use no more than 300 feet of hose line. In warehouse and hanger areas, the hydrants should be about 300 feet apart. About 18 inches should be between the lowest hydrant outlet and grade (ground), and not more than 4 feet should be between the operating nut and grade. The principal opening (4 1/2 inches) should face the nearest road or approach. Hydrants that cannot be located away from traffic (loading dock or warehouse areas) should be protected with sturdy barriers designed to prevent damage to a hydrant without obstructing its use.

FLOW TEST

5-25. A flow test measures the pressure of a hydrant's system. A small main may have only two hydrants, which should provide an accurate reading. Large mains may have as many as five hydrants; three is a normal count. One

hydrant in a system is a residual hydrant and is located the furthest from the supply mains.

5-26. To measure the pressure in a hydrant's system, remove the cap on a residual hydrant and install a Bourdon pressure gauge. Open the hydrant and record the pressure. During this test, water does not flow from the residual hydrant. The other hydrants tested in the system are called flowing hydrants. Remove one 2 1/2-inch cap from each flowing hydrant, and measure the outlet diameters to the nearest 1/16 inch. Open the valves of all hydrants in the test group in succession, and read the pressure at all hydrants. The pressure at the flowing hydrants is the velocity pressure. The pressure at a residual hydrant is the pressure that remains in the system. The pressure at a residual hydrant depends on the number of flowing hydrants.

5-27. You can use a pitot tube to measure velocity pressure more accurately. Hold a tube in the center of a water stream, 1 inch from the face of an outlet. Depending on the readings, adjust the openings of the flowing hydrants so that the pressure at the residual hydrant is at least 10 psi. Use these pressure readings to compute hydrant discharges. Use the following formula to obtain the discharge of each hydrant:

$$Q = av$$

where—
Q = *amount of flow, in GPM*
a = *cross-section area of a stream, in inches*
v = *velocity of a moving stream, in psi*

5-28. The total discharge is the sum of all pressure readings of all flowing hydrants in a system. Use DA Form 5384-R to calculate velocity pressure. The velocity cannot exceed 20 psi.

5-29. The capacity of an installation's distribution system is usually based on a residual pressure of 10 psi. Using the test data, compute the capacity at 10 psi pressure using DA Form 5384-R. The results should be the maximum rate at which water can be drawn from a system without reducing the pressure in it to less than 10 psi. Use the instructions below to complete DA Form 5384-R:

- Determine which scale you should use.
- Plot the total discharge on the chart.
- Plot the residual pressure on the chart.
- Indicate where these two lines intersect.
- Plot the static pressure on the vertical scale.
- Draw a straight line from the static pressure point through the residual pressure point on the water-flow scale.
- Read and record the GPM available flow at 10 psi per gallon.

5-30. The reading represents how much water is available if the pressure lost in a fire hydrant, hydrant branch, and pump-section hose is disregarded. A residual pressure of 10 psi is required when rating Army water systems.

SECTION III. FIRE PREVENTION DURING FIELD-TRAINING EXERCISES (FTXS)/ DEPLOYMENTS

5-31. During a FTX/deployment, a commander is responsible for fire prevention. He ensures that—

- A fire warden is appointed and actively supervises all fire-prevention measures during the FTX/deployment.
- Bivouac areas, including tents, are inspected daily for fire hazards.
- Fire hazards are eliminated and regulations are enforced. These include no storing of gasoline or diesel fuel inside a tent, no smoking in bed (or in a sleeping bag), and not placing clothing or other flammables close to lanterns, stoves, or stove pipes.
- Personnel are trained in using fire-fighting equipment, fire reporting, and fire prevention.
- Fireguards are posted. (One person, clothed and alert, will be designated as fireguard and will remain inside a tent when a heater or a gasoline lantern is burning.)
- Personnel are trained to operate and maintain POL-consuming devices properly.
- Candles and liquid-fuel stoves and lanterns are not left unattended while they are burning in a tent. (When all personnel in a tent are asleep, the stove, lantern, or candle will be turned off or put out.)
- Refueling of liquid-fuel equipment or devices does not take place in tents.

SMOKING

5-32. All personnel must be extremely cautious when disposing of smoking materials. During a summer FTX/deployment, a space will be cleared through the surface litter down to mineral soil. Cigars, cigarette butts, or pipe ashes will be placed in the cleared spot and ground into the soil until they are completely out. SMOKING IS PROHIBITED IN ANY VEHICLE and within 50 feet of any storage area. Personnel will never throw burning materials from any vehicle. Butt cans will be provided in bivouac areas and will be dumped into a pit covered with mineral soil or packed with snow daily.

MATCHES

5-33. Safety matches should be used. After striking any match, the person using it will break it and feel the burnt end, ensuring that it is completely out before throwing it away.

OPEN FIRES

5-34. When hazardous conditions exist, a unit commander will prohibit open fires. When the fire index is high, there will be no open burning. If using an open fire is part of a summer FTX/deployment, personnel will—

- Scrape flammable materials from an area 6 feet in diameter and dig a small hole in the center down to mineral soil for the fire.
- Keep the fire small and never build it against trees or logs or near brush.
- Have at least one person attend the fire at all times.
- Never use gasoline or kerosene to start or quicken the fire.
- Stir the coals while soaking them with water before leaving the fire. Likewise, they will turn and soak all sticks.
- Cover the fire pit with 6 inches of dirt that is free of leaves, twigs, and other vegetable matter. However, before covering the pit, they will make a final check of the ashes, ensuring that the fire is completely out.
- Never hang wet clothing over or close to an open fire unless they post a guard until the clothing is removed.

FLARES AND SMOKE GRENADES

5-35. Personnel who use flares or smoke grenades, or who are in an area where they are used or dropped, will locate the remains of the device and completely extinguish any burning residue and render any hot particles harmless.

HEATERS

5-36. Many units rely on heaters to keep their tents warm in the winter. If used properly, these heaters will perform well in all cold-weather regions. However, misusing heaters can cause and has caused many fatalities in the field. Commanders should ensure that only qualified personnel set up, operate, and refuel these heaters. Since flames can engulf most tents in less than 10 seconds, personnel must follow the procedures in the operator's manual and the guidelines discussed below:

5-37. When setting up and working with heaters, personnel must—

- Never refuel a heater that is in operation; spilled fuel could ignite.
- Always post a fireguard at night.
- Have fire extinguishers available in every tent that has a heater.
- Keep flammable materials such as pine needles or spruce boughs away from the heater.

- Always use drip pans. Without them, fuel drips directly on the ground and could ignite.
- Never block tent exits with meals, ready to eat (MRE) cases or water cans or by rolling snow flaps inside and holding them down with personal gear.

TENTS

5-38. When setting up and dealing with tents, personnel must—

- Space all 5- and 10-man tents at least 10 feet apart. For larger tents, they should space them at least 30 feet apart.
- Keep areas in and around the tents as free of debris as possible and maintain the area at high standards. During the fire season, they must clear the grass and brush from within 3 feet of 5- and 10-man tents and within 10 feet of larger tents.
- Securely mount and fasten fuel cans at least 1 foot from the outside area of the tent. They must also equip fuel lines with drip interceptors.
- Be cautious when smoking or using flame-producing objects around tents. Tents are not fire-resistive; they are flame-retardant, which prevents rapid burning. They could be damage beyond economical repair if exposed to but not destroyed by fire.
- Not use duct-type heaters (Herman-Nelson type) inside a tent or structure. If they do use this type heater, personnel must ensure that a minimum of 15 feet is between a tent or structure and the heater. They must also ensure that the heating ducts are insulated with noncombustible material where they enter a tent or structure. Personnel must not refuel the heater until they can touch the combustion chamber with their bare hand. They must clean up all spills before refueling the unit.
- Install heaters according to the appropriate TM.

VEHICLES

5-39. When dealing with vehicles during a FTX/deployment, personnel will—

- Not refuel a vehicle while the engine is running or within 50 feet of any flame-producing equipment.
- Ensure that vehicles are a minimum of 10 feet between each other during refueling. Personnel will also ensure that a grounding cable is connected between the dispensing and receiving vehicles.
- Not park vehicles within 10 feet of any tent or storage rack.
- Not stop or park vehicles in areas that have established fires lane. However, personnel can load or unload vehicles in these areas, but they must ensure that the vehicles are constantly attended.

STORAGE AREAS

5-40. When considering and dealing with storage areas during a FTX/ deployment, personnel will—

- Select sites that have minimum vegetation. During the fire season, they will remove or cut and maintain grass and brush to a 2-inch height limit within the storage area and 20 feet around it.
- Limit storage piles to stacks that are 6 feet high, 10 feet wide, and 20 feet long. They will ensure that the ends of the stacks are at least 10 feet from each other and that they have 20-foot wide fire lanes between the long sides.
- Maintain POL storage areas according to the TMs. They must ensure that these areas are at least 50 feet from any tent or equipment and in a location so that drainage (in case of a leak) will be away from inhabited areas.
- Post special caution signs, when required by what is being stored.
- Police the area thoroughly every day, and remove all rubbish/trash to the disposal pit area.
- Store reusable containers in separate piles.
- Store containers that hold flammables in a POL area, ensuring that the lids are tightly closed.
- Store ammunition in igloos or in isolated areas that the ammunition surveillance officer has approved.

CAMOUFLAGE

5-41. When dealing with concealing materials and devices from air-to-ground observation, including nets and foliage, during a FTX/deployment, personnel will—

- Not install camouflage within 1 foot of any muffler or exhaust system or any other surface that may be heated under normal operating conditions. They will securely fasten all materials that are near such surfaces.
- Not start the engines of camouflaged equipment until they inspect the equipment to ensure that all combustible material is clear of the exhaust and its discharge.
- Frequently inspect camouflage material to ensure that it is securely moored so that the wind or moving mooring points will not allow any material to drop on a hot surface.
- Keep the open flames of all cooking equipment at least 5 feet away from any camouflaged material.

DISTRIBUTION OF FIRE EXTINGUISHERS

5-42. During a FTX/deployment, fire extinguishers are required as follows:

- Mess tents—two 20-pound ABC extinguishers.
- POL—four 20-pound ABC extinguishers per 15,000 gallons of POL.
- Herman-Nelson heaters—one 2 1/2-pound BC extinguisher, or equivalent.
- Vehicles—as per AR 385-55, paragraph 22.
- Maintenance tents—two 20-pound ABC extinguishers per tent.
- Sleeping tents—one 2 1/2-pound dry-chemical extinguisher, minimum, if the tent contains any heat-producing device or open flame.